

rising or falling in reference to a datum-line, the time-scale being indicated on the latter. Prof. Steinmann, in the paper above noticed, has employed similar curves for various regions in the Alps. Dr. Ampferer holds that a similarity in the curves for two or more areas would imply a general similarity in the foundation. This seems to leave out of count Mr. Osmond Fisher's suggestion of convection-currents in a liquid interior, which might produce considerable local differences in the curves; but the absence of all reference to previous workers, except a passing one to Schardt's and Lugcon's theory of over-folding, makes it uncertain how far Dr. Ampferer wishes to link himself with his predecessors. While admitting (p. 620) that his criticism has been largely of a destructive order, he feels hopeful that future research may make us better acquainted with the "Untergrund."

Dr. Ampferer's paper was written in March, 1906, but was not issued until December. Meanwhile, Mr. R. A. Daly had published a paper on abyssal igneous injection as a causal condition and as an effect of mountain-building (*American Journ. of Sci.*, vol. xxii., September, 1906, p. 195). Ampferer does not believe in geosynclinals and subsequent lateral compression; but it is precisely these that Daly sets out to explain. He urges that the underlying molten magma, which he believes to be of basaltic composition, is always ready to leap into any cracks that arise in the plastic layer above it and in the "shell of tension" in the lower portion of the crust. Cracks may arise in the plastic layer by the effects of tidal torsion on the crust, and in the shell of tension by the general contraction due to cooling. The igneous mass in the great dykes thus produced, so long as it remains liquid, exercises a hydrostatic pressure on its walls, and forces them further apart. Here we have a cause that may close up other cracks in the shell of tension, and the total lateral creep "involves a strong downward pull exerted on the shell of compression," i.e. that part of the crust above the level of no strain. The resulting geosynclinal area finally becomes weakened, as sediments accumulate in it and its underlying rocks are bent down into hotter regions; and then, in some way which is rather lightly dealt with, an "orogenic collapse" takes place, and a mountain-chain begins to rise. The increase in bulk of the crust by magmatic injection, which was, by the by, well pointed out by Mr. Osmond Fisher, is urged as an additional cause of its crumpling, and the hydration of its minerals gives similar assistance. The shearing apart of the shell of compression and the shell of tension "during the orogenic revolution releases the tensions still unrelieved in the underlying shell," and allows of further abyssal injection on a large scale. The location and elongation of mountain-chains and geosynclinals are all (p. 216) related to special zones of abyssal injections from the substratum. Here we see Mr. Daly looking, like Dr. Ampferer, for final causes in the "Untergrund," and with this point of agreement we must for the moment rest content.

Still more recently (March, 1907), Dr. L. Waagen publishes in the *Verhandlungen der k.k. geologischen Reichsanstalt* a general review of the relations of ocean-basins and mountain-chains. He finds the origin of folding in the subsidence of continental masses, and the continued sinking of the moving *Hinterland* of a chain may bring this region below sea-level, and so promote an interchange between continental and oceanic areas. Marine transgressions (p. 121) are thus the natural accompaniments of epochs of considerable mountain-building.

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#### THE SOUTH AFRICAN ASSOCIATION.

THE report of the South African Association for the Advancement of Science (Cape Town, 1907), a handsome volume of 640 pages, affords striking evidence of the large amount of attention that is being devoted to scientific research in South Africa. The report includes the presidential address delivered by Mr. T. Reunert at Johannesburg in 1905, in which year the usual sectional meetings were not held, and minutes of the proceedings of the fourth meeting of the association at Kimberley in 1906. The address of the president, Mr. G. F. Williams, who was unable to attend the Kimberley meeting in 1906,

contains an interesting historical sketch of the settlement of the Cape, of the adventurous spirit of the Portuguese, of the influence of the Dutch pioneers, and of the rush of adventurers from almost every part of the world, who laid the foundation of the mining industry of to-day.

The president of Section A, Mr. J. R. Sutton, gave a valuable summary of our present knowledge of the diurnal variation of barometric pressure, which may be considered as the fundamental problem in meteorology—the rise and fall of the barometer twice a day, the precise cause of which has never been satisfactorily explained. After referring to the efforts of Herschel, Dove, and others, the author pointed out that Dr. Buchan made a material advance in distinguishing between the weight and elasticity of the air. Perhaps the most important contribution to the subject is due to Prof. J. Hann, who by classifying and generalising the harmonic elements for a great number of stations succeeded in establishing some noteworthy results. Among the various papers read in this section, some of which have been published elsewhere, we may specially mention:—(1) Anticyclones and their influence on South African weather, by Colonel H. E. Rawson. An examination of the charts published by the London Meteorological Office, and of other data, showed that the weather in South Africa is under the direct influence of the movements of two great anticyclonic systems lying to the west and east. (2) The barometer in South Africa, by Mr. R. T. A. Innes. The author states that the annual variation of the barometer consists of a well-marked single oscillation, pressure being greatest in winter and least in summer. (3) Variability of temperature in South Africa, by Mr. J. R. Sutton, as represented by three typical stations, showing the mean difference between the temperatures of one day and the next. Prof. J. Milne contributed a paper on the observation of earthquakes and other earth movements, and Prof. R. A. Lehfeldt one on accelerations of gravity at Johannesburg.

At the various sectional meetings sixty papers were read, which are published in full or in abstract. Among these, noteworthy papers dealing with matters of local interest are, in addition to those already mentioned:—Rev. H. A. Junod, on the theory of witchcraft among South African natives; Rev. F. Reuter, on northern Transvaal ethnology; Mr. A. W. Rogers, on the glacial beds of the Griqua Town series; Mr. R. H. Rastall, on the petrography of the Kimberley district; Mr. J. P. Mennell, on the Somabula diamond field of Rhodesia; Mr. J. P. Johnson, on the Stone age of South Africa; Mr. F. A. Hurley and Mr. C. D. H. Braine, on irrigation in South Africa; Mr. K. A. H. Hought, on native education in its higher branches; and Mr. T. Lowden, on the place of manual training in South African education.

Of the sectional presidential addresses, that by Mr. Sidney J. Jennings, on wastes in mining, waste of thought, waste of labour, and waste of material, should be mentioned. Nothing has proved so efficacious for the prevention of waste of thought as the free interchange of ideas made possible by the numerous societies and associations. Centralised management can also be made to perform a valuable function in preventing thought-waste. In preventing waste of labour, the fundamental difficulties lie in the untrained condition of the Kafir for manual labour, and in the ineptitude of many white overseers for transforming a semi-savage population into an industrial one. The best prevention of waste of stores is the continued thought of the management combined with the loyal and interested cooperation of the men.

An account of a discussion on university education in South Africa is contained in the report. The discussion was opened by Prof. Lyster Jameson with a brief survey of the past history and present position of university education in South Africa, followed by a summary of the more obvious remedies for the present unsatisfactory state of affairs. There is a single university, the University of the Cape of Good Hope, an examining body pure and simple. In addition to the University, several institutions calling themselves colleges have arisen. In the Transvaal the only institution seriously doing university work is the Transvaal University College, which was founded as a full faculty of mining and engineering, adding its arts department at a later date. However great the dis-

advantage of federation or of separation, the greatest peril to university education in South Africa lies in the excessive multiplication of institutions with poor endowment and small, underpaid and overworked staffs. The discussion was well sustained; and, in summing up, the chairman, Mr. S. J. Jennings, pointed out that in Germany and England a population of a million could support a university. Roughly speaking, a population of a million in South Africa would correspond in fee-paying capacity with a population of two millions in Germany or England. It therefore seemed within the range of possibility that South Africa could support two universities.

### INTERNATIONAL MARINE INVESTIGATIONS.<sup>1</sup>

THIS summary of the results so far obtained by the international investigation of the North and adjacent seas is drawn up by the executive committee of the Swedish Hydrographic-biological Commission, and is the second of its kind. Being well written, illustrated by good charts and plates, and demanding no great previous knowledge from the reader, it is one of those accurate yet popular accounts which, by educating public opinion in the utility of research, possess a real public value. Its slight unevenness is probably inevitable in the rapid survey of so wide a field, and it is to be regretted that the language in which it appears will restrict so narrowly the number of its readers.

The introduction patriotically reminds us that Sweden took the initiative in cooperation in marine research when King Oscar issued invitations to the conferences of Stockholm (1899) and Christiania (1900), and states the aim of the work to be, in the terms of a resolution of the latter meeting, "to prepare for the rational exploitation of the sea on a scientific basis." The aim is thus practical; the writers proceed at once to discuss the urgent practical question which played a considerable part in securing British participation in the international scheme, namely, the over-fishing question.

The belief that the catch of fish (mainly trawl-caught fish) was greater than nature replaced had arisen, declined, and revived when the international work began. Remedies had been proposed, and, being based on insufficient knowledge of the sea, had failed. The authors unreservedly include among the failures the closure of areas to trawling and the replenishment of the sea by fish-hatcheries; they speak hopefully of the value of market statistics, recognise the recent improvements in English methods of collection, and pass to the biological attack on the problem. This section is a little disappointing. Much has been ascertained concerning intensity of fishing, migration, &c., the bearing of which on over-fishing is not clearly brought out in the text. Since, for instance, over-fishing is stated to affect plaice mainly by reducing the average size at which they are caught, any experimental evidence of a possibility of increasing the rate of growth deserves close consideration; yet the promising results of transplanting plaice from crowded "nurseries" to good feeding-grounds where growth is more rapid are very briefly dealt with.

To make any proposal for restrictive legislation before the International Council has fully sifted the evidence collected on over-fishing seems premature, and, from the representatives of a country not greatly interested in trawling, even a little out of place. The writers, however, advise that each country fix an inshore size limit independently, while no plaice should be landed from off-shore grounds of less length than 28 cm., that limit to be gradually increased to 33 cm. As to the practicability of enforcing this rather complicated scheme they are silent; possibly wisely.

Numerous biological researches are described, but by far the greatest detail is accorded to hydrography. Even Prof. Petterssen's theory of the effect of ice melting is included, although, as Nansen's "Northern Waters" has shown, it is still controversial. The Baltic hydrography is perhaps the freshest section for English readers. Hydrography gained much from cooperation; the standardising of instru-

<sup>1</sup> "Resultaten af den Internationella Hafsörkningens arbete under åren 1902-1906, och Sveriges andel däruti. By G. Ekman, O. Petter-sen, F. Trybom. Pp. 164. (Stockholm: Isaac Marcus, 1907.)

ments and reagents removed one frequent source of wasted opportunity in earlier voyages, by making all observations more strictly comparable, while the periodic cruises of the numerous vessels employed ensured regular observations over the whole great area involved. The main result has been the discovery that European seas are flooded every autumn by Atlantic water (of 35 per mille salinity or more) which withdraws in spring, and that many fisheries depend on these movements. Such a fishery is that of the Swedish "winter herring"; the fish is abundant, and the fishery prosperous when southern bank-water, of characteristic salinity, temperature and plankton, forms a thick layer in the Baltic entrances, while in years of exceptional abundance of Atlantic water this displaces the overlying bank-water, and a "bad herring year" results. These years occasion considerable distress.

The summary closes with appendices, some of which, semi-diplomatic documents now apparently published for the first time, are worth careful perusal by all interested in fishery legislation and research. One, written by Prof. Petterssen in reply to a question from the English Board of Agriculture and Fisheries, as to the probability of practical results shortly appearing, is especially interesting. Prof. Petterssen mentions the confusion of ideas and opinions that, owing to lack of knowledge of the sea, prevailed before the international work began, describes the results attained and the value set on cooperation by the investigators, and, speaking of the protection of immature fish, he makes the noteworthy remark, "International measures of this kind must be founded on strong and indisputable evidence. . . . Such evidence can only be the outcome of a joint investigation of the total area in question, executed by the best specialists of every nation concerned." These words constitute now, as they did three years ago, a weighty defence of international cooperation in fishery research.

### THE TRANSVAAL DEPARTMENT OF AGRICULTURE.

WE have received from the director a copy of the annual report of the Transvaal Department of Agriculture for the year 1905-6. The department was formed soon after the close of the war, and was placed under the charge of Mr. F. B. Smith, who had been trained at Cambridge and had gained experience as an agriculturist at Wye College, of which he was for some years the vice-principal. On his arrival in the Transvaal, Mr. Smith gathered round him a band of zealous and competent workers, and organised the new department on American lines, assigning the work to a number of "divisions." Each of these, while independent and under the charge of separate heads, was kept in close touch with the work of the other divisions through the director of the department and his office staff.

The report for the past year gives a *résumé* of the work on which the new department is now engaged, which should prove of interest not only to those directly concerned, but to many in our own country who may wish to know what the trained agriculturist can do to assist the development of the colonies. The most obviously beneficial work of the department is that of the veterinary division, which was formed partly to investigate the numerous diseases which threatened the live stock of the colony at the close of the war, but chiefly to check the spread of disease by treating diseased animals and by administering acts regulating their movements. The need for this type of work may be inferred from the fact that during the year 726 outbreaks of contagious disease were dealt with, 140,000 animals inspected, and 660,000 examined for soundness at the ports or on the borders of the Transvaal before being admitted into the country.

The acts regulating the movement of diseased animals have caused stock-owners some inconvenience and have been the subject of occasional complaints, but they have succeeded in a remarkable way in improving the health of the live-stock. For example, the disease known as East Coast fever, which at the close of the war was a serious menace to the cattle of the colony, has been overcome, and large areas have been altogether freed from it. In 1904-5 about 8000 cattle died of this disease; in 1905-6 the number was